Advisory: On-Road Engines in Off-Road Vehicles

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California Environmental Protection Agency
AIR RESOURCES BOARD

Summary

Beginning in 2010, the in-use off-road diesel vehicle regulation will require anyone that owns off-road diesel vehicles in California to begin reducing harmful emissions from their diesel exhaust. Many fleets have already begun looking for ways to reduce emissions while keeping costs down.

Construction companies are starting to consider and undertake projects that utilize on-road engines to replace existing off-road engines. The on-road certified diesel engines used in such projects to date, model year 2007, were manufactured to more stringent emissions standards than 2007 off-road diesel engines. Repowering scrapers with on-road engines has provided the construction fleets with a cost effective means of lowering their emissions and meeting the upcoming regulation requirements.

Both on-road diesel engine manufacturers and end users who elect to utilize this compliance alternative should be aware that this alternative may affect the on-road engine's emission control system warranty required by title 13, California Code of Regulations (CCR) section 2035 et seq, as discussed further on the third page.

The Benefits of Repowering with On-Road Engines

The differences between on-road and off-road certified engines will vary depending on the year and horsepower, however for some model years an on-road certified engine may emit up to 90 percent less the particulate matter (PM) and 70 percent less nitrogen oxides (NOx) as a comparable off-road engine. Repowering a vehicle with an on-road engine may allow a fleet to meet the emissions targets in the off-road diesel regulation by completing fewer engine repowers or vehicle replacements than would be required if they had used off-road engines.

Additionally, some new on-road certified engines come with a diesel particulate filter (DPF) included by the manufacturer. Repowers using an engine with a DPF will grant credit toward the off-road regulation as if the fleet had installed a verified exhaust retrofit device that reduces PM. If the repower is completed before March 1, 2009, or was purchased before November 1, 2008, ARB will grant the fleet double credit towards the retrofit requirements in the regulation[1].

For the construction companies using on-road certified engines in their scrapers, repowering with a 2007 on-road certified engine that came with a DPF cost

[1] ARB staff have proposed to extend the deadline to retrofit and receive double credit by 10 months, to January 1, 2010. The Board will consider this proposal on January 22, 2009.

substantially less than the combined cost of repowering with an off-road engine and installing an exhaust retrofit (see figure below), however this may vary by application. The on-road engines also had substantially lower emissions than the off-road engine would have had even after a retrofit was installed.

Scraper with a 2007 Certified On-Road Engine

Receiving Credit for On-Road Engines

To receive credit for the reduced emissions an on-road engine provides compared to a an off-road engine, the fleet must report the emissions standard the on-road engine was certified to as well as the certification executive order (EO) or the certificate number.

A list of executive orders is available from ARB's certification database, available at: http://www.arb.ca.gov/msprog/onroad/cert/cert.php.

An example of the emissions information in an on-road engine EO is shown below, with the applicable data shown in bold. A fleet repowering with this engine would report a NOx emission factor of 0.2 g/bhp-hr and a PM emissions factor of 0.01 g/bhp-hr:

	NMHC		**NOx**		NMHC+NOx		CO		**PM**		HCHO	
	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO	FTP	EURO
STD	0.02	0.14	**0.2**	.25	.	.	15.5	15.5	**0.01**	0.01	·	·
FEL	.	.					.	.	**.**	.	·	·
CERT	0.02	0.03	.15	0.15			1.7	0.1	0.01	0,01	·	·

Warranty Information

All fleets and installers who choose to pursue this compliance option should be aware of the possible implications to the engine's emissions control system warranty, as outlined in Title 13, CCR. Specifically, 13 CCR 2036(j)(1) states that "[t]he repair or replacement of any warranted part otherwise eligible for warranty coverage under subsection (d) or (i), shall be excluded for such warranty coverage if the vehicle or engine manufacturer demonstrates that the vehicle or engine has been abused, neglected, or improperly maintained, and that such abuse, neglect, or improper maintenance was the direct cause of the need for the repair or replacement of the part."

Therefore, if an engine manufacturer demonstrates that installing an on-road engine into an off-road application constitutes "abuse, neglect, or improper maintenance" that directly causes damage to a warranted part, it could refuse to repair or replace any warranted part on the on-road engine.

Safety Concerns

Vehicle owners should be aware of several important safety issues before pursuing this option, and the vehicle owner should ensure they are working with experienced mechanics who understand both the on-road engine requirements and the use of the vehicle in question. Possible issues include making sure that the off-road application provides sufficient cooling for the on-road engine, and that the structure of the vehicle is not impaired by the modification necessary to install the on-road engine.